Journal of Educational Technology Studies and Applied Research
journal.teknologipendidikan.or.id/index.php/jetsar

Development Of Mobile-Based Augmented Reality For Enjoyful Learning For ADHD Students

Fitrah Rohimah Agma Putri [a], Henry Praherdhiono [b], Zainul Abidin [c]

[a] *State University of Malang, Indonesia*
[b] *State University of Malang, Indonesia*
[c] *State University of Malang, Indonesia*

Abstract

The purpose of this research is to develop mobile-based augmented reality to provide a fun learning experience for students with Attention Deficit Hyperactivity Disorder (ADHD). This research uses the development model of Sadiman, et al 2010. In completing the development of mobile-based augmented reality applications for fun learning in ADHD students using 9 stages, namely needs analysis, goal formulation, formulation of material items, formulation of success measurement tools, media storyboard script writing, media production, validation, revision, media ready for use. The development results received a positive response from the validity test by the material with an average of 93.75%, while the media expert gave an assessment of 92.5%. Thus, it can be concluded that the development of mobile-based augmented reality applications for fun learning in ADHD students has been proven valid and can be used for learning for ADHD students.

Keywords: inclusive education, equal access, innovation, learning opportunities

Introduction

This research aims to provide a new experience using augmented reality technology-based learning media so that people with ADHD (Attention Deficit Hyperactivity Disorder) can get and feel an enjoyable and meaningful learning experience so as to develop cognitive in students with ADHD. Attention deficit hyperactivity disorder, often referred to as Attention Deficit Hyperactive Disorder (ADHD), is a neuropsychiatric syndrome that has recently been found in students. Symptoms of lack of concentration that occur in ADHD students can interfere with the child's developmental period in terms of cognition, behavior, socialization and communication (Hatiningsih, 2013).

In fact, students with ADHD (Attention Deficit Hyperactivity Disorder) have symptoms such as lack of concentration and can interfere with cognitive development in students with ADHD, therefore students who have a history of ADHD tend to have difficulty in maintaining their attention on tasks or activities that require focus and also students with ADHD are often directed to the development of talents and talents, however, lacking in general knowledge (Husnah, 2007). Students with ADHD often face challenges in concentration during classroom lessons. They may need a quiet environment and adapted learning strategies to help them focus therefore, teachers must understand that students with ADHD may have difficulty following complex instructions, can be highly creative and talented (Urbayatun et al., 2019). It is important for schools and parents to provide support in developing their talents while managing challenges and concentration (Afifah & Nasution, 2023).

In the context of learning for ADHD students, consideration and attention are needed in using media / assistive devices according to the needs of students (Ariyanto, 2017). Media / assistive devices intended here are everything that is used and supports learning, both in the form of sophisticated technology products and simple technology. Learning media technology develops so quickly along with the development of technology every year. Technological advances are very likely to bring new innovations in the world of education (Kauffman, 2010), the entire world population often spends time playing smartphones wherever the place, this makes smartphones very popular (Ningsih & Adesti, 2019). By utilizing the practical technology of smartphones, students can learn anywhere and anytime. Learning using smartphones students can learn independently, students also save more time and will be more active in learning (Rahardjo et al., 2019). Learning does not always have to be done in the classroom, laboratory or teacher-centered, learning using smartphones is considered easier to use for learning and students quickly adjust to the media (Surahman & Surjono, 2017).

Augmented reality is a new technology that adds virtual (artificial) objects such as text, animation, 3D models by combining them into a real environment or object. It can be interpreted that augmented reality can complement real environmental conditions rather than replace them (Azuma, 1997). Augmented reality technology as learning media has been recognized for its benefits in dealing with real-world tasks with the support of digital systems (Chang & Hwang, 2018). Augmented reality for learning media can provide students with new learning resources in understanding concepts and materials, encourage students to think based on concepts and feel 3D (three-dimensional) and create an

* Corresponding author at: State University of Malang,Indonesia.
E-mail address: fitrah.rohimah.2001216@students.um.ac.id (Putri, F. R. A.)

Available online 31 Agustus 2024, Vol. 1 No. 1, pp. 10 - 14

interactive and attractive learning atmosphere and more fun in learning in the classroom (Ivanova & Ivanov, 2011).

Learning media that is able to clarify learning messages and information, which can improve the process and results of student learning, and can be motivated in learning, the media is produced in order to overcome the limitations of the senses, space and time so that students can use the media wherever the place of learning and whenever students will learn (Arsyad, 2015). Learning media plays an important role in teaching activities. The use of media is part of the learning process that must be considered. Not only that, the method of learning must also be considered, one of which is the enjoyfull learning method. The enjoyful learning method is a learning system that seeks to arouse interest, full involvement and the creation of meaning, understanding, and happy values from students. In it there is no more physical or psychological pressure (Juliati & Rafiqah, 2017).

Natural Science (IPA) subjects with material Knowing the types of herbivorous, omnivorous and carnivorous animals with Augmented Reality-based aims to create enjoyful learning in ADHD students. Based on the results of observations and interviews conducted on one of the students with ADHD, it was found that he had difficulty in the learning process in the classroom. This child faces several challenges that need to be assisted in the learning process. One of the main obstacles identified is that when ADHD students are given full textbooks, they will experience difficulty concentrating on memorising learning. This tends to lead to a sense of lagging behind the child with his friends in the class. Based on interviews with his parents, the learning methods used for this child are generalised with his friends because, in his neighbourhood there is no inclusive school for students with ADHD, this shows that the child does not feel enjoyment in his learning and has difficulty concentrating, especially with science subjects. To overcome this challenge, it is necessary to implement learning media that can provide a clearer picture of science learning so that students can understand the material better. Moreover, the media should also be designed to increase enjoyful learning and active involvement in the learning process. In the learning process, attention should also be paid to the use of learning materials both individually through individual learning programmes and in the classroom through the pre-learning stage, pre-learning stage, learning stage, and post-learning stage.

Method

This research uses the type of research and development (research and development). This research aims to produce products and test the feasibility of products. The product developed in this study is augmented reality learning media . Mobile augmented reality media development research as a supplement to this science textbook uses the Sadiman development model (Sadiman et al., 2018). This development model has several stages, namely: needs analysis, goal formulation, material formulation, formulation of success measurement tools, media storyboard script writing, media production validation, revision, ready-to-use media.

Needs analysis is a stage to find a problem that occurs in the field, then find a problem that occurs in the field, then find a solution that can solve the problem. At this stage, identification of needs is carried out in the form of data collection through observation and interviews with ADHD students who attend one of the schools in Malang. Observation aims to observe ADHD students's learning directly in the classroom and at home. Interviews aim to find out the characteristics of ADHD students and the media used in learning. The purpose of this research is to develop augmented reality-based learning media so that students with ADHD can have a fun and memorable learning experience with the use of this technology as well as ADHD students can train attention and focus skills which can indirectly improve performance in learning.

The development of this media is in line with the material items in accordance with SK, KD, indicators and learning objectives in the discovery of problems in the field where ADHD students do not feel enjoyful (fun) in understanding the learning material, especially in the introduction of herbivorous, carnivorous and omnivorous animal species. At this stage, an evaluation of the learning outcomes or the results of using the developed mobile augmented reality is carried out which aims to determine how much ADHD students understand the material that has been delivered in augmented reality. To measure the understanding of ADHD students, a learning outcome test is given in the form of a pre-test and post-test of the material content of the augmented reality that has been developed. If the feedback obtained is satisfactory, it means that it can be concluded that the developed media has succeeded in providing students's understanding.

Media scripts are useful as instructions when carrying out production activities or the media development process. In this development, the script is made containing an instruction containing information that is used as a reference in making a media. The production stage is the stage of implementing the script or storyboard that has been designed into the media to be developed. In a media production, it must adjust to the script or storyboard that has been designed. Validation is a process to be able to measure the feasibility of the media that has been developed. Activities at this stage involve material experts and media experts.

Findings & Discussion

Findings

Learning media produced in the form of augmented reality for ADHD students. The results of this augmented reality development after being validated by material experts and learning media media experts.

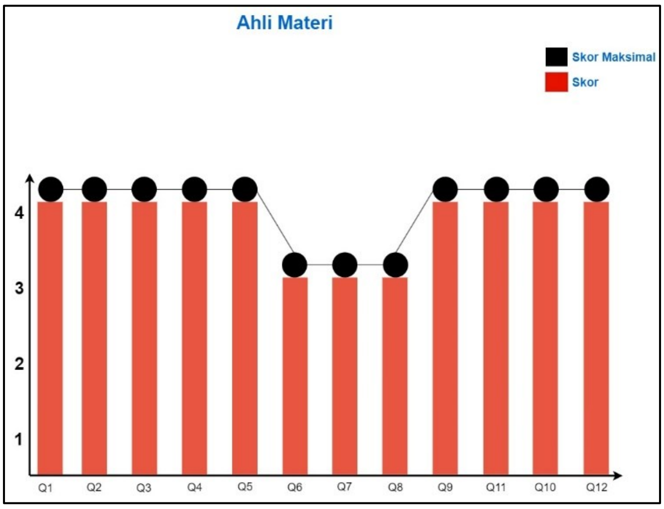


Figure 1 Subject Matter Expert Validation Results

Furthermore, the validity test was carried out to the material expert, see Figure 1, from 12 statement items there were 9 items that received SS (4.00 / 100%), namely, the suitability of learning objectives, the ease with which students understand learning, the ease of achieving learning objectives, the attractiveness of the material, the suitability of the material with daily life, the suitability of examples to help understanding, the suitability of supporting visuals, the suitability of relevant sources, the suitability of the material with the level of development and understanding. There are 3 statement items that get an S (3.00/ 75%), namely: focusing the material, the suitability of the material with the curriculum, the suitability of the material with the learning objectives. Based on the results of the overall score given by the material expert, it can be seen that the material expert gave a positive response with an average of 0.9375 or 93.75% of the maximum score of 4.00 or 100%. Based on the responses obtained from the material experts, it can be said that the Introduction to Herbivorous, Omnivorous and Carnivorous Animals is valid and very feasible in terms of material.

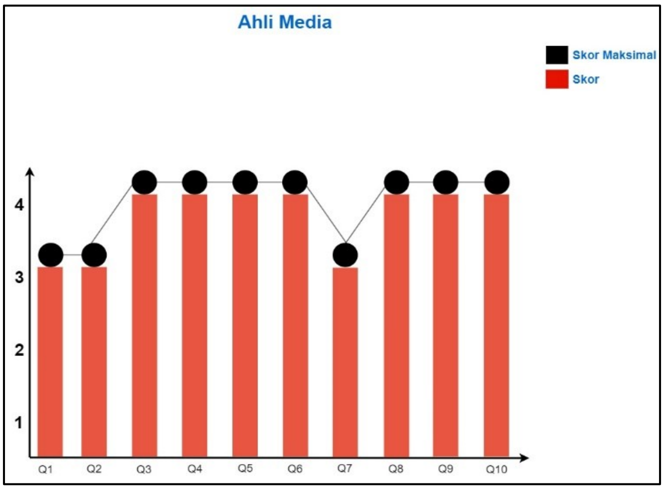


Figure 2 Learning Media Expert Validation Results

The results of the validity test to media experts, from 10 statement items, there are 7 items that get SS scores (4.00 / 100%), namely, user instructions, gestureaugmented reality, 3D object flexibility, media objects, cover display, object details and object size.

There are 3 statement items that get a score of (3.00 / 75%), namely: understanding of learning, 3D objects according to student needs and the shape of 3D objects. Based on the overall score given by the media expert, it can be seen that the media expert gave a positive response with an average of 0.925 or 92.5% of the maximum score of 4.00 or 100%. Based on the results of responses obtained from material experts, it can be said that the Introduction to Herbivorous, Omnivorous and Carnivorous Animals is valid and very feasible in terms of media.

Discussion

The development of 3D augmented reality mobile technology as a visual media theme of knowing the types of carnivorous, herbivorous and omnivorous animals for students with ADHD was developed as a learning companion. Preliminary research conducted is a needs analysis in the form of direct observation and interviews. Based on the results of observations and interviews that have been conducted on ADHD students who attend one of the schools in Malang, obstacles are found in the form of the child having difficulty focusing on his learning so that he feels left behind with his friends in class. In addition, the child also has difficulty understanding learning because he has Attention Deficit Hyperactivity Disorder (ADHD). Based on the results of observations and interviews so that students can focus on learning material about carnivores, herbivores and omnivores, a solution is given in the formulation of learning objectives using artificial media that can visualise objects combined with augmented reality technology and packaged in the form of smartphone applications. With the use of 3D objects combined with augmented reality technology used for learning can improve student understanding (Utami, 2011) and can focus the attention of learners into real objects or events.

Next is the formulation of science learning material items with the sub-theme of introducing carnivorous, herbivorous and omnivorous animals. At this stage the material is consulted with the subject teacher and the material to be developed is the grouping of animals based on the type of food that contains animals grouped into 3 namely herbivores, carnivores and omnivores. To determine the success of the media in achieving learning objectives are media expert questionnaires, material expert questionnaires, student questionnaires for the achievement of learning using products that have been developed after that enter the media production stage according to the material that has been determined.

The next stage is augmented reality media has passed the validity test stage involving material experts and media experts. The results of the validity test process received a very positive response, where the high score obtained from the material expert was 0.9375 or 93.75%, and in terms of material it was declared valid without the need for additional revisions. This concludes that the material in the augmented reality mobile fulfils almost all aspects of material validity

and is declared valid. Furthermore, the results of the validity test by media experts also showed very positive results with a value of 0.925 or 92.5%. This mobile augmentedreality was also declared valid without requiring additional revisions in the media. Therefore, mobile augmented reality can be considered valid and feasible to use in the field. In addition to the assessment results, the experts also provided comments and suggestions. The material expert commented that this augmented reality is very feasible to use but a little revision for the diction of the words used. Furthermore, the media experts also revealed that in general, this media has reached a very good level of quality and is suitable for use in the field, however, some need to be revised, especially in the layout and composition of the images. Thus, it can be concluded that mobile augmented reality qualifies as a learning tool for students with ADHD.

Furthermore, this augmented reality was tested on ADHD students in 1 stage, namely individual trials. Individual trials were conducted on 2 ADHD students who both had symptoms of audio-visual ADHD. ADHD students selected in individual trials were asked to provide comments or input about the media by filling out the questionnaire distributed.

Conclusion

The result of this research is the development of 3D augmented reality mobile technology as a visual media to introduce carnivorous, herbivorous, and omnivorous animals to children with ADHD. Preliminary research included needs analysis through observation and interviews, identifying children's difficulties in learning focus and understanding due to ADHD. As a solution, learning objectives were formulated using augmented reality-based mock media through smartphone applications. The validity test was conducted by involving material experts and media experts. The validity test results showed a positive response from both experts, with material and media validity values reaching 93.75% and 92.5% respectively. The augmented reality media was considered feasible without the need for additional revisions from both experts.

The main conclusion of this research is that the mobile augmented reality developed can be considered as a valid learning tool and very feasible to use for students with ADHD. The positive results from the validity test as well as the responses of material experts and media experts indicate that this media can help improve students' focus and understanding in enjoyful learning in learning, in accordance with the research objectives. These results can also be seen from the application of learning media to ADHD children indicating that children enjoy learning and focus on learning through augmented reality.

Acknowledgements
Author does not povide any acknowledgements.

Authors Contributions
Author does not provide any authors contributions information.

Funding
Author does not provide any funding information.

Declarations

Competing Interest
The authors report there are No. competing interest to declare.

References

Afifah, N., & Nasution, F. (2023). Peran Guru Bimbingan dan Konseling (BK) dalam Mengembangkan Kepercayaan Diri dan Kesejahteraan (Well Being) Siswa. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, *4*(2), 368–380. https://doi.org/10.31538/munaddhomah.v4i2.458

Ariyanto, D. (2017). Peran Teknologi Pembelajaran dalam Mendukung Implementasi Pendidikan Inklusi. *International Conference on Special Education in Southeast Asia Region*, 381–386.

Arsyad, A. (2015). *Media pembelajaran* (Revised). Raja Grafindo Persada.

Azuma, R. T. (1997). A Survey of Augmented Reality. *Presence: Teleoperators and Virtual Environments*, *6*(4), 355–385. https://doi.org/10.1162/pres.1997.6.4.355

Chang, S.-C., & Hwang, G.-J. (2018). Impacts of an augmented reality-based flipped learning guiding approach on students' scientific project performance and perceptions. *Computers & Education*, *125*, 226–239. https://doi.org/10.1016/j.compedu.2018.06.007

Hatiningsih, N. (2013). PLAY THERAPY UNTUK MENINGKATKAN KONSENTRASI PADA ANAK ATTENTION DEFICIT HYPERACTIVE DISORDER (ADHD). *Jurnal Ilmiah Psikologi Terapan*, *1*(2), Article 2. https://doi.org/10.22219/jipt.v1i2.1586

Husnah, A. (2007). *Efektifitas terapi ABA (Applied Behavior Analysis) pada anak penderita ADHD (Attention Deficit Hyperactive Disorder) di pusat terapi terpadu anak dengan kebutuhan khusus A plus Jln. Blitar no. 02 Malang* [Undergraduate, Universitas Islam Negeri Maulana Malik Ibrahim]. http://etheses.uin-malang.ac.id/8935/

Ivanova, M., & Ivanov, G. (2011). Communications in Computer and Information Science: Using Marker Augmented Reality Technology for Spatial Space Understanding in Computer Graphics. In H. Cherifi, J. M. Zain, & E. El-Qawasmeh (Eds.), *Digital Information and Communication Technology and Its Applications* (Vol. 166, pp. 368–379). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-21984-9_32

Juliati, N., & Rafiqah, R. (2017). EFEKTIVITAS PENERAPAN METODE ENJOYFULL LEARNING DALAM PENINGKATAN MINAT BELAJAR SISWA KELASX SMA NEGERI 1 BOLO KAB. BIMA. *JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar*, *5*(1), Article 1. https://doi.org/10.24252/jpf.v5i1.3265

Kauffman, M. (2010). Teaching with technology: College preparation with AVID. *Capstone Projects and Master's Theses*, *315*. https://digitalcommons.csumb.edu/caps_thes/315

Ningsih, S., & Adesti, A. (2019). Pengembangan Mobile Learning Berbasis Android Pada Mata Kuliah Strategi Pembelajaran Universitas Baturaja. *Edcomtech: Jurnal Kajian Teknologi Pendidikan*, *4*(2), Article 2. https://doi.org/10.17977/um039v4i22019p163

Rahardjo, T., Degeng, I. N. S., & Soepriyanto, Y. (2019). Pengembangan Multimedia Interaktif Mobile Learning Berbasis Anrdroid Aksara Jawa Kelas X SMK Negeri 5 Malang. *JKTP: Jurnal Kajian Teknologi Pendidikan*, *2*(3), Article 3. https://doi.org/10.17977/um038v2i32019p195

Sadiman, A. S., Harjito, Haryono, A., & R., R. (2018). *Media Pendidikan: Pengertian, Pengembangan, dan Pemanfaatannya* (18th ed.). Rajawali Press.

Surahman, E., & Surjono, H. D. (2017). Pengembangan adaptive mobile learning pada mata pelajaran biologi SMA sebagai upaya mendukung proses blended learning. *Jurnal Inovasi Teknologi Pendidikan*, *4*(1), Article 1. https://doi.org/10.21831/jitp.v4i1.9723

Urbayatun, S., Fatmawati, L., Erviana, V. Y., & Maryani, I. (2019). *KESULITAN BELAJAR & GANGGUAN PSIKOLOGIS RINGAN PADA ANAK: Implementasi pada Anak Usia Sekolah Dasar*. K-Media.

Utami, D. (2011). Animasi Dalam Pembelajaran. *MAJALAH ILMIAH PEMBELAJARAN*, *7*(1), Article 1. http://journal.uny.ac.id/mip/article/view/3212